

- a defect source; and
- a reliability-enhancing layer positioned within the defect source to reduce defect-induced degradation of one or more VCSEL regions.

48. A vertical cavity surface emitting laser (VCSEL), comprising:

- a first mirror stack;
- a second mirror stack;
- a cavity region disposed between the first mirror stack and the second mirror stack and including an active region;
- a defect source; and
- a reliability-enhancing layer positioned with respect to the defect source to reduce defect induced degradation of one or more VCSEL regions, wherein the defect source is disposed between the reliability-enhancing layer and the cavity region.

49. The VCSEL of claim 48, further comprising a second reliability-enhancing layer separated from the first reliability-enhancing layer by one or more other layers, wherein the first and second reliability-enhancing layers are located on opposite sides of the defect source.

50. A vertical cavity surface emitting laser (VCSEL), comprising:

- a first mirror stack;
- a second mirror stack;
- a cavity region disposed between the first mirror stack and the second mirror stack and including an active region;
- a defect source; and
- a reliability-enhancing layer positioned with respect to the defect source to reduce defect induced degradation of one or more VCSEL regions, wherein the reliability-enhancing layer is configured to at least in part balance strain created by the defect source.

51. The VCSEL of claim 50, wherein the defect source includes an oxide region

inducing a compressive strain field, and the reliability-enhancing layer is positioned within the compressive strain field and is characterized by tensile strain.

52. The VCSEL of claim 50, wherein at least one of the first and second mirror stacks comprises oxidized AlGaAs layers and the reliability-enhancing layer is formed from $\text{In}_x\text{Ga}_{1-x}\text{P}$, wherein $x < 0.5$ tensile.

53. A vertical cavity surface emitting laser (VCSEL), comprising:
a first mirror stack;
a second mirror stack;
a cavity region disposed between the first mirror stack and the second mirror stack and including an active region;
a defect source; and
a reliability-enhancing layer positioned with respect to the defect source to reduce defect induced degradation of one or more VCSEL regions, wherein the defect source creates a concentration gradient inducing defect migration, and the reliability-enhancing layer is configured to reduce the induced defect migration.

54. A method of manufacturing a vertical cavity surface emitting laser (VCSEL), comprising:
forming a first mirror stack, a second mirror stack, and a cavity region disposed therebetween, wherein the cavity region includes an active region;
forming a defect source; and
forming a reliability-enhancing layer, wherein the reliability-enhancing layer is positioned within the defect source to reduce defect-induced degradation of one or more VCSEL regions.

55. A method of manufacturing a vertical cavity surface emitting laser (VCSEL), comprising:
forming a first mirror stack, a second mirror stack, and a cavity region disposed therebetween, wherein the cavity region includes an active region;
forming a defect source; and

forming a reliability-enhancing layer positioned with respect to the defect source to reduce defect-induced degradation of one or more VCSEL regions, wherein the defect source is disposed between the reliability-enhancing layer and the cavity region.

56. The method of claim 55, further comprising forming a second reliability enhancing layer separated from the first reliability-enhancing layer by one or more other layers, wherein the first and second reliability-enhancing layers are located on opposite sides of the defect source.

57. A method of manufacturing a vertical cavity surface emitting laser (VCSEL), comprising:

forming a first mirror stack, a second mirror stack, and a cavity region disposed therebetween, wherein the cavity region includes an active region;

forming a defect source; and

forming a reliability-enhancing layer positioned with respect to the defect source to reduce defect-induced degradation of one or more VCSEL regions, wherein the reliability enhancing layer is configured to at least in part balance strain created by the defect source.

58. The method of claim 57, wherein the defect source includes an oxide region inducing a compressive strain field, and the reliability-enhancing layer is positioned within the compressive strain field and is characterized by tensile strain.

59. The method of claim 57, wherein at least one of the first and second mirror stacks comprises oxidized AlGaAs layers and the reliability-enhancing layer is formed from $\text{In}_x\text{Ga}_{1-x}\text{P}$, wherein $x < 0.5$ tensile.

60. A method of manufacturing a vertical cavity surface emitting laser (VCSEL), comprising:

forming a first mirror stack, a second mirror stack, and a cavity region disposed therebetween, wherein the cavity region includes an active region;

forming a defect source; and